PATENT ABSTRACTS OF JAPAN

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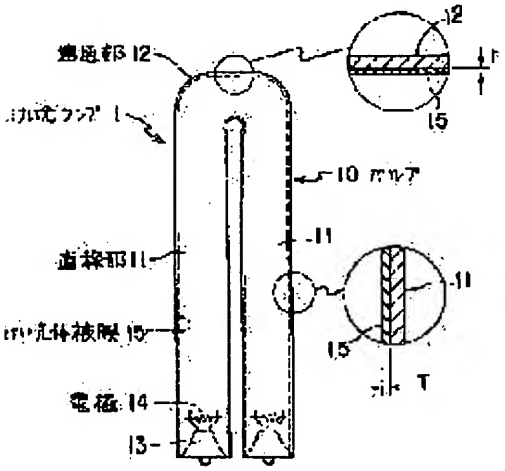
(54) BENT TYPE FLUORESCENT LAMP AND LUMINAIRE USING IT

(57)Abstract:
PURPOSE: To provide a bent type fluorescent lamp capable of preventing unevenness of color or a see-through phenomenon and also strength lowering, and a luminaire using this lamp.
CONSTITUTION: In a bent type fluorescent lamp 1 wherein a phosphor film 15 is formed on the inner surface of a bulb 10 having straight line parts 11 on both ends and also having a communication part 12 communicating these straight line parts with each other, the film thickness (t) of a phosphor in the communication part 12 is made 8.0 μm or more and the film thickness T or less of a phosphor in the straight line part 11. Consequently since the film thickness of the phosphor in the communication part becomes thick to lessen a difference with the film thickness of the phosphor in the straight part, unevenness of color and also a see-through phenomenon in the communication part are eliminated and film thickness is increased to improve mechanical strength.



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CLAIMS

[Claim(s)]
[Claim 1] The crookedness form fluorescent lamp characterized by having set thickness t of the fluorescent material in the above-mentioned free passage section to 8.0 micrometers or more, and carrying out to below the thickness T of the fluorescent material in a bay in the crookedness form fluorescent lamp which formed the fluorescent-material coat in the inside of the bulb which has the free passage section which opens both these bays for free passage while equipping both ends with a bay.
[Claim 2] The crookedness form fluorescent lamp characterized by being referred to as 0.28 <=t/T<=1 when thickness of fluorescent material [in / for the thickness of the fluorescent material in the above-mentioned free passage section / t and a bay] is set to T in the crookedness form fluorescent lamp which formed the fluorescent-material coat in the inside of the bulb which has the free passage section which opens both these bays for free passage, while equipping both ends with a bay.
[Claim 3] Lighting fitting characterized by having the crookedness form fluorescent lamp of above-mentioned claim 1 or claim 2, and the reflector which emits light for one side direction of this lamp from other side directions with a wrap.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to lighting fitting using the crookedness form fluorescent lamp and this which formed the fluorescent-material coat in the inside of crookedness configuration bulbs, such as U typeface.
[0002]
[Description of the Prior Art] Recently, the fluorescent lamp (the compact form is called) with which it comes to carry out crookedness shaping of the configuration of a bulb at U typeface, zygal, or W typeface is spreading widely. This kind of fluorescent lamp has a bay to the both ends of a bulb, while ****(ing) an electrode at the end, respectively, the structure of these bays which opened the other end for free passage mutually by the free passage sections, such as a flection, is made, and the fluorescent-material coat is formed in the inside of a bulb.
[0003] If the opening edge of a bay is turned upward when forming a fluorescent-material coat in the inside of the above-mentioned bulb in a such crookedness form fluorescent lamp, the coating liquid of fluorescent material is poured in into the bulb from this opening edge and coating liquid is full in this bulb, will carry out vertical reversal of the bulb, and the coating liquid of the above-mentioned opening edge to a surplus is made to flow out, this soaks the inside of a bulb in coating liquid, and he is trying to apply to a bulb inside. And holding an opening edge into a downward posture, Ayr for desiccation is blown into the interior of a bulb from this opening edge, and the above-mentioned coating liquid is dried by [so-called] carrying out the Ayr blow.
[0004] Although the solution which melted fluorescent-material powder may be used for an organic solvent as coating liquid, it worries about accident, such as a fire, and since handling is troublesome, an organic solvent tends to use water-soluble coating liquid recently. However, since desiccation is slow, he is trying for water-soluble fluorescent-material coating liquid to promote desiccation by the above-mentioned Ayr blow.
[0005] However, as for the bay which, as for the free passage section which coating liquid flows along with a bulb wall surface in process of desiccation even if it adopts a such Ayr blow, and falls, and is located upwards for this reason, that spreading thickness becomes relatively and thin, and is located downward compared with this, spreading thickness tends to become thick.
[0006]
[Problem(s) to be Solved by the Invention] If the thickness of the free passage section becomes too much thin too much, while the engine performance which changes ultraviolet rays into the light will fall and producing an irregular color with the location of a bulb, it may be transparent and visible during lighting and an appearance falls remarkably. One side direction of this kind of lamp is especially covered by the reflector, and, in the case of lighting fitting which emits light from other side directions, there is fault it is transparent and it is faultily conspicuous to be an irregular color and

that it is visible.

[0007] Moreover, in addition to being the part which stress tends to generate from the first, when the free passage section has the thin thickness of the fluorescence here, a mechanical strength falls and it also has the fault which is easy to damage. It is going to offer the crookedness form fluorescent lamp which this invention was made based on such a situation, it can be transparent, and the place made into the purpose can prevent being an irregular color and that it is visible, and can also prevent a strong fall, and lighting fitting using this.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, a crookedness form fluorescent lamp according to claim 1 is characterized by having set thickness t of the fluorescent material in the free passage section to 8.0 micrometers or more, and carrying out to below the thickness T of the fluorescent material in a bay. Moreover, a crookedness form fluorescent lamp according to claim 2 is characterized by being referred to as 0.28 <=t/T<=1, when thickness of fluorescent material [in / for the thickness of the fluorescent material in the free passage section / t and a bay] is set to T. Lighting fitting according to claim 3 is characterized by having the crookedness form fluorescent lamp of above-mentioned claim 1 or claim 2, and the reflector which emits light for one side direction of this lamp from other side directions with a wrap.

[0009]

[Function] Since according to the crookedness form fluorescent lamp of this invention the thickness of the fluorescent material of the free passage section becomes thick and a gap with the thickness of the fluorescent material of a bay becomes small, while an irregular color is canceled, since it is lost that the free passage section is transparent and it is visible and thickness becomes large, a mechanical strength improves. Moreover, according to lighting fitting of this invention, since it is transparent and it is canceled being [of a lamp] an irregular color and that it is visible, dispersion in a color or brightness is lost and a luminous-intensity-distribution property becomes good.

[0010]

[Example] This invention is explained based on the 1st example shown in drawing 1 thru/or drawing 6 below. Drawing 1 shows the fluorescent lamp 1 of U typeface, and 10 is the bulb fabricated to U typeface in drawing. A bulb 10 has bays 11 and 11 to both ends, and has opened them for free passage mutually by the free passage section 12 which consists these bays 11 and 11 of a flection. The electrodes 14 and 14 of bays 11 and 11 supported by stems 13 and 13 are ****(ed) by the edge, respectively.

[0011] The fluorescent-material coat 15 is formed in the inside of a bulb 10. Although it is desirable that it continues all over a bulb and is equal as for the thickness of a fluorescent-material coat, a thickness difference occurs for dispersion at the time of shaping. However, in the case of this example, thickness T of fluorescent material [in / in the thickness t of the fluorescent material in the free passage section 12 / 9.0 micrometers and a bay 11] is set to an average of 28 micrometers, and it has become t/T=0.32.

[0012] In the conventional case, the thickness t of the fluorescent material in the free passage section 12 was about 7.5 micrometers on the average, and the thickness T of the fluorescent material in a bay 11 was set to an average of 28 micrometers, and was t/T=0.268. Therefore, in the case of this example, the thickness in a bay 11 is the same as usual, but the thickness in the free passage section 12 is large compared with the former, and the thickness difference of a bay 11 and the free passage section 12 is small.

[0013] In order to make the thickness difference of a fluorescent-material coat small in a bay 11 and the free passage section 12, it is realizable using the desiccation approach shown in drawing 2 . That is, 30 in drawing 2 is the dryer of a fluorescent-material coat, and is held with the posture in which the

free passage section 12 of a bulb turns to a top for the crookedness form bulb 10 which applied water-soluble fluorescent-material coating liquid to the inside by the bulb electrode holder 31 and the bulb hook 32, and a bay 11 turns to the bottom. Ayr for desiccation is sprayed on the interior of a bulb 11 with internal blow equipment 33 from lower limit opening of a bulb 10. At this time, Ayr for desiccation is sprayed with external blow equipment 34 towards the external surface of the free passage section 12 from the upper part of the free passage section 12.

[0014] The temperature of Ayr sprayed on the interior of a bulb 10 from internal blow equipment 33 is a room temperature, and the rate of flow is about 5.0m/second. Moreover, the temperature of Ayr sprayed on the external surface of the free passage section 12 from external blow equipment 34 is a room temperature, and the rate of flow is about 3-7.0m/second.

[0015] Thus, if an external blow is performed to an internal blow and coincidence, the temperature of the free passage section 12 will come to be compensated by external blow. That is, when fluorescent material dries, and moisture evaporates, remarkable heat is taken and cooling to the extent that the outside surface of a bulb blooms cloudy with moisture is made. Then, in order to compensate with the taken heat, Ayr is sprayed from the exterior and heat is supplied by this Ayr. That is, desiccation of the fluorescent-material coating liquid which performed partial heating by the external blow and, as a result, applied the free passage section 12 to the free passage section 12 is urged.

[0016] however -- if Ayr (100-300 degrees C) where temperature is high is sprayed in this case -- liquid -- the unevenness of who or thickness becomes remarkable and surface **** gets worse. This is for the viscosity of coating liquid to carry out a sudden fall while desiccation begins from the coating liquid layer near the front face of BERUBU quickly, since sudden heating of the bulb is carried out. Therefore, the temperature of Ayr to spray has desirable room temperature extent.

[0017] Drawing 3 is drawing which measured the blow air rate of flow of an external blow, and the relation of the drying time. From this property, the effectiveness that the drying time decreases [the rate of flow of an external blow] in a second in 1-3m /shows up.

[0018] Moreover, drawing 4 is drawing which measured the relation between the blow air rate of flow of an external blow, and the coating weight of fluorescent material. From this drawing, the coating weight of fluorescent material rises [the rate of flow of an external blow] up to about 7m/second.

[0019] And drawing 5 shows the relation between the blow air rate of flow of an external blow, and the thickness of fluorescent material. Even if the Ayr rate of flow of an external blow changes, the thickness of a bay 11 hardly changes from this drawing, but it is about an average of 28 micrometers. On the other hand, the thickness of the free passage section 12 is increasing as the Ayr rate of flow of an external blow becomes large, and thickness becomes [the rate of flow] large up to about 7m/second. And if it is about 7.5 micrometers on an average in the former (the Ayr rate of flow of an external blow is zero), but the external blow approach is used for the thickness of the free passage section 12, it will be set to 8.0-12 micrometers, and, therefore, the thickness of the free passage section 12 will become large.

[0020] Since it is such, it is prevented that the gap of the thickness of the free passage section 12 and the thickness of a bay 11 becomes small, the function to change ultraviolet rays into the light therefore stops producing a difference, and an irregular color generates the fluorescent lamp 1 of the above-mentioned example in the free passage section 12 and a bay 11. Moreover, since thickness becomes large, the free passage section 12 is not transparent and visible during lighting, and its appearance also improves. It is the table which judged whether drawing 6 shows the result of the appearance test by the thickness of fluorescent material, and they would be seen [ten trial people would also be transparent and] by the eye. It is judged that it is transparent and visible from this table when the thickness of the fluorescent-material coat 15 is less than 8.0 micrometers, or it is transparent and easy to be visible, therefore 8.0 micrometers or more of thickness are good.

[0021] Furthermore, when the free passage section 12 applied fluorescent material, a mechanical strength becomes high, and moreover, reinforcement becomes large, so that the thickness is large. Therefore, stress concentrates and breakage of the free passage section [win] 12 is prevented. In addition, if the thickness of fluorescent material becomes too much thick too much, fluorescent material will be resembled and the quantity of light will fall more for a self-absorption. For this reason, the thickness of a bay 11 has desirable about 28 micrometers.
[0022] Therefore, if the crookedness form fluorescent lamp 1 sets thickness t of the fluorescent material in the free passage section 12 to 8.0 micrometers or more and it is made below into the thickness T of the fluorescent material in a bay 11, it will be transparent, and it will be prevented being an irregular color and that it is visible, and its mechanical strength will improve. It is 0.28 <=t/T<=1, when this was expressed with the thickness ratio and thickness of fluorescent material [in / for the thickness of the fluorescent material in the free passage section / t and a bay] is set to T. What is necessary will be just to carry out.
[0023] The above compact form fluorescent lamps 1 are built into the reflector 20 as shown in drawing 7 , for example, are used as stand lighting fitting. A reflector 20 levels the shade in which the inferior surface of tongue was opened wide, and holds nothing and the above-mentioned fluorescent lamp 1, and, therefore, as for the fluorescent lamp 1, the top-face side is covered by the reflector 20.
[0024] If there is an irregular color in the bay 11 and the free passage section 12 of a lamp 1 in the case of such lighting fitting, the light which is reflected by the reflector 20 and illuminates a lower part will also produce an irregular color and the unevenness of brightness. On the other hand, when the fluorescent lamp 1 shown in said drawing 1 is used, since an irregular color is canceled in a bay 11 and the free passage section 12, an irregular color and the unevenness of brightness are lost in the light which irradiates a lower part, and a luminous-intensity-distribution property becomes good.
[0025] In addition, in the case of the above-mentioned example, the fluorescent lamp of U typeface was explained, but this invention may be the fluorescent lamp of W typeface. Moreover, this invention may be a fluorescent lamp of zygal shown in drawing 8 . The fluorescent lamp 30 of zygal is near the lock out edge, joins two straight pipe form glass tubes 31 and 31 by the fused junction section 32, and since a discharge way serves as a crookedness configuration substantially, it thinks as one sort of the crookedness form fluorescent lamp of this invention, and it does not interfere. before [in this case,] joining the fluorescent-material coat 35 by the fused junction section 32 beforehand -- the inside of each straight pipe form glass tube 31 and 31 -- forming -- after that -- a glass wall -- heating fusion -- carrying out -- blowing -- breaking -- this -- it blows, and it breaks and joins in a part. However, when forming a fluorescent-material coat in the inside of each straight pipe form glass tube 31 and 31, since the end is blockaded, like the case where it is shown in drawing 2 , each tubes 31 and 31 place an opening edge upside down, and dry fluorescent-material coating liquid. For this reason, the thickness of a lock out edge side inside becomes thin, and is a victory. Therefore, the same effectiveness as the case of U typeface fluorescent lamp 1 can be acquired by adopting the approach of drawing 2 and increasing the thickness by the side of a lock out edge, i.e., the free passage section.
[0026]
[Effect of the Invention] Since it becomes, without the free passage section being transparent and being visible, while an irregular color is canceled according to this invention, since the thickness of the fluorescent material of the free passage section becomes thick and a gap with the thickness of the fluorescent material of a bay becomes small as explained above, and thickness becomes large, a mechanical strength improves.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] This invention relates to lighting fitting using the crookedness form fluorescent lamp and this which formed the fluorescent-material coat in the inside of crookedness configuration bulbs, such as U typeface.

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PRIOR ART

[Description of the Prior Art] Recently, the fluorescent lamp (the compact form is called) with which it comes to carry out crookedness shaping of the configuration of a bulb at U typeface, zygal, or W typeface is spreading widely. This kind of fluorescent lamp has a bay to the both ends of a bulb, while ****(ing) an electrode at the end, respectively, the structure of these bays which opened the other end for free passage mutually by the free passage sections, such as a flection, is made, and the fluorescent-material coat is formed in the inside of a bulb.
[0003] If the opening edge of a bay is turned upward when forming a fluorescent-material coat in the inside of the above-mentioned bulb in a such crookedness form fluorescent lamp, the coating liquid of fluorescent material is poured in into the bulb from this opening edge and coating liquid is full in this bulb, will carry out vertical reversal of the bulb, and the coating liquid of the above-mentioned opening edge to a surplus is made to flow out, this soaks the inside of a bulb in coating liquid, and he is trying to apply to a bulb inside. And holding an opening edge into a downward posture, Ayr for desiccation is blown into the interior of a bulb from this opening edge, and the above-mentioned coating liquid is dried by [so-called] carrying out the Ayr blow.
[0004] Although the solution which melted fluorescent-material powder may be used for an organic solvent as coating liquid, it worries about accident, such as a fire, and since handling is troublesome, an organic solvent tends to use water-soluble coating liquid recently. However, since desiccation is slow, he is trying for water-soluble fluorescent-material coating liquid to promote desiccation by the above-mentioned Ayr blow.
[0005] However, as for the bay which, as for the free passage section which coating liquid flows along with a bulb wall surface in process of desiccation even if it adopts a such Ayr blow, and falls, and is located upwards for this reason, that spreading thickness becomes relatively and thin, and is located downward compared with this, spreading thickness tends to become thick.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] Since it becomes, without the free passage section being transparent and being visible, while an irregular color is canceled according to this invention, since the thickness of the fluorescent material of the free passage section becomes thick and a gap with the thickness of the fluorescent material of a bay becomes small as explained above, and thickness becomes large, a mechanical strength improves.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] If the thickness of the free passage section becomes too much thin too much, while the engine performance which changes ultraviolet rays into the light will fall and producing an irregular color with the location of a bulb, it may be transparent and visible during lighting and an appearance falls remarkably. One side direction of this kind of lamp is especially covered by the reflector, and, in the case of lighting fitting which emits light from other side directions, there is fault it is transparent and it is faultily conspicuous to be an irregular color and that it is visible.
[0007] Moreover, in addition to being the part which stress tends to generate from the first, when the free passage section has the thin thickness of the fluorescence here, a mechanical strength falls and it also has the fault which is easy to damage. It is going to offer the crookedness form fluorescent lamp which this invention was made based on such a situation, it can be transparent, and the place made into the purpose can prevent being an irregular color and that it is visible, and can also prevent a strong fall, and lighting fitting using this.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, a crookedness form fluorescent lamp according to claim 1 is characterized by having set thickness t of the fluorescent material in the free passage section to 8.0 micrometers or more, and carrying out to below the thickness T of the fluorescent material in a bay. Moreover, a crookedness form fluorescent lamp according to claim 2 is characterized by being referred to as 0.28 <=t/T<=1, when thickness of fluorescent material [in / for the thickness of the fluorescent material in the free passage section / t and a bay] is set to T. Lighting fitting according to claim 3 is characterized by having the crookedness form fluorescent lamp of above-mentioned claim 1 or claim 2, and the reflector which emits light for one side direction of this lamp from other side directions with a wrap.

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OPERATION

[Function] Since according to the crookedness form fluorescent lamp of this invention the thickness of the fluorescent material of the free passage section becomes thick and a gap with the thickness of the fluorescent material of a bay becomes small, while an irregular color is canceled, since it is lost that the free passage section is transparent and it is visible and thickness becomes large, a mechanical strength improves. Moreover, according to lighting fitting of this invention, since it is transparent and it is canceled being [of a lamp] an irregular color and that it is visible, dispersion in a color or brightness is lost and a luminous-intensity-distribution property becomes good.

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EXAMPLE

[Example] This invention is explained based on the 1st example shown in drawing 1 thru/or drawing 6 below. Drawing 1 shows the fluorescent lamp 1 of U typeface, and 10 is the bulb fabricated to U typeface in drawing. A bulb 10 has bays 11 and 11 to both ends, and has opened them for free passage mutually by the free passage section 12 which consists these bays 11 and 11 of a flection. The electrodes 14 and 14 of bays 11 and 11 supported by stems 13 and 13 are ****(ed) by the edge, respectively.
[0011] The fluorescent-material coat 15 is formed in the inside of a bulb 10. Although it is desirable that it continues all over a bulb and is equal as for the thickness of a fluorescent-material coat, a thickness difference occurs for dispersion at the time of shaping. However, in the case of this example, thickness T of fluorescent material [in / in the thickness t of the fluorescent material in the free passage section 12 / 9.0 micrometers and a bay 11] is set to an average of 28 micrometers, and it has become t/T=0.32.
[0012] In the conventional case, the thickness t of the fluorescent material in the free passage section 12 was about 7.5 micrometers on the average, and the thickness T of the fluorescent material in a bay 11 was set to an average of 28 micrometers, and was t/T=0.268. Therefore, in the case of this example, the thickness in a bay 11 is the same as usual, but the thickness in the free passage section 12 is large compared with the former, and the thickness difference of a bay 11 and the free passage section 12 is small.
[0013] In order to make the thickness difference of a fluorescent-material coat small in a bay 11 and the free passage section 12, it is realizable using the desiccation approach shown in drawing 2 . That is, 30 in drawing 2 is the dryer of a fluorescent-material coat, and is held with the posture in which the free passage section 12 of a bulb turns to a top for the crookedness form bulb 10 which applied water-soluble fluorescent-material coating liquid to the inside by the bulb electrode holder 31 and the bulb hook 32, and a bay 11 turns to the bottom. Ayr for desiccation is sprayed on the interior of a bulb 11 with internal blow equipment 33 from lower limit opening of a bulb 10. At this time, Ayr for desiccation is sprayed with external blow equipment 34 towards the external surface of the free passage section 12 from the upper part of the free passage section 12.
[0014] The temperature of Ayr sprayed on the interior of a bulb 10 from internal blow equipment 33 is a room temperature, and the rate of flow is about 5.0m/second. Moreover, the temperature of Ayr sprayed on the external surface of the free passage section 12 from external blow equipment 34 is a room temperature, and the rate of flow is about 3-7.0m/second.
[0015] Thus, if an external blow is performed to an internal blow and coincidence, the temperature of the free passage section 12 will come to be compensated by external blow. That is, when fluorescent material dries, and moisture evaporates, remarkable heat is taken and cooling to the extent that the outside surface of a bulb blooms cloudy with moisture is made. Then, in order to compensate with the

taken heat, Ayr is sprayed from the exterior and heat is supplied by this Ayr. That is, desiccation of the fluorescent-material coating liquid which performed partial heating by the external blow and, as a result, applied the free passage section 12 to the free passage section 12 is urged.

[0016] however -- if Ayr (100-300 degrees C) where temperature is high is sprayed in this case -- liquid -- the unevenness of who or thickness becomes remarkable and surface **** gets worse. This is for the viscosity of coating liquid to carry out a sudden fall while desiccation begins from the coating liquid layer near the front face of BERUBU quickly, since sudden heating of the bulb is carried out. Therefore, the temperature of Ayr to spray has desirable room temperature extent.

[0017] Drawing 3 is drawing which measured the blow air rate of flow of an external blow, and the relation of the drying time. From this property, the effectiveness that the drying time decreases [the rate of flow of an external blow] in a second in 1-3m /shows up.

[0018] Moreover, drawing 4 is drawing which measured the relation between the blow air rate of flow of an external blow, and the coating weight of fluorescent material. From this drawing, the coating weight of fluorescent material rises [the rate of flow of an external blow] up to about 7m/second.

[0019] And drawing 5 shows the relation between the blow air rate of flow of an external blow, and the thickness of fluorescent material. Even if the Ayr rate of flow of an external blow changes, the thickness of a bay 11 hardly changes from this drawing, but it is about an average of 28 micrometers. On the other hand, the thickness of the free passage section 12 is increasing as the Ayr rate of flow of an external blow becomes large, and thickness becomes [the rate of flow] large up to about 7m/second. And if it is about 7.5 micrometers on an average in the former (the Ayr rate of flow of an external blow is zero), but the external blow approach is used for the thickness of the free passage section 12, it will be set to 8.0-12 micrometers, and, therefore, the thickness of the free passage section 12 will become large.

[0020] Since it is such, it is prevented that the gap of the thickness of the free passage section 12 and the thickness of a bay 11 becomes small, the function to change ultraviolet rays into the light therefore stops producing a difference, and an irregular color generates the fluorescent lamp 1 of the above-mentioned example in the free passage section 12 and a bay 11. Moreover, since thickness becomes large, the free passage section 12 is not transparent and visible during lighting, and its appearance also improves. It is the table which judged whether drawing 6 shows the result of the appearance test by the thickness of fluorescent material, and they would be seen [ten trial people would also be transparent and] by the eye. It is judged that it is transparent and visible from this table when the thickness of the fluorescent-material coat 15 is less than 8.0 micrometers, or it is transparent and easy to be visible, therefore 8.0 micrometers or more of thickness are good.

[0021] Furthermore, when the free passage section 12 applied fluorescent material, a mechanical strength becomes high, and moreover, reinforcement becomes large, so that the thickness is large. Therefore, stress concentrates and breakage of the free passage section [win] 12 is prevented. In addition, if the thickness of fluorescent material becomes too much thick too much, fluorescent material will be resembled and the quantity of light will fall more for a self-absorption. For this reason, the thickness of a bay 11 has desirable about 28 micrometers.

[0022] Therefore, if the crookedness form fluorescent lamp 1 sets thickness t of the fluorescent material in the free passage section 12 to 8.0 micrometers or more and it is made below into the thickness T of the fluorescent material in a bay 11, it will be transparent, and it will be prevented being an irregular color and that it is visible, and its mechanical strength will improve. It is 0.28 <=t/T<=1, when this was expressed with the thickness ratio and thickness of fluorescent material [in / for the thickness of the fluorescent material in the free passage section / t and a bay] is set to T. What is necessary will be just to carry out.

[0023] The above compact form fluorescent lamps 1 are built into the reflector 20 as shown in

drawing 7 , for example, are used as stand lighting fitting. A reflector 20 levels the shade in which the inferior surface of tongue was opened wide, and holds nothing and the above-mentioned fluorescent lamp 1, and, therefore, as for the fluorescent lamp 1, the top-face side is covered by the reflector 20.
[0024] If there is an irregular color in the bay 11 and the free passage section 12 of a lamp 1 in the case of such lighting fitting, the light which is reflected by the reflector 20 and illuminates a lower part will also produce an irregular color and the unevenness of brightness. On the other hand, when the fluorescent lamp 1 shown in said drawing 1 is used, since an irregular color is canceled in a bay 11 and the free passage section 12, an irregular color and the unevenness of brightness are lost in the light which irradiates a lower part, and a luminous-intensity-distribution property becomes good.
[0025] In addition, in the case of the above-mentioned example, the fluorescent lamp of U typeface was explained, but this invention may be the fluorescent lamp of W typeface. Moreover, this invention may be a fluorescent lamp of zygal shown in drawing 8 . The fluorescent lamp 30 of zygal is near the lock out edge, joins two straight pipe form glass tubes 31 and 31 by the fused junction section 32, and since a discharge way serves as a crookedness configuration substantially, it thinks as one sort of the crookedness form fluorescent lamp of this invention, and it does not interfere. before [in this case,] joining the fluorescent-material coat 35 by the fused junction section 32 beforehand -- the inside of each straight pipe form glass tube 31 and 31 -- forming -- after that -- a glass wall -- heating fusion -- carrying out -- blowing -- breaking -- this -- it blows, and it breaks and joins in a part. However, when forming a fluorescent-material coat in the inside of each straight pipe form glass tube 31 and 31, since the end is blockaded, like the case where it is shown in drawing 2 , each tubes 31 and 31 place an opening edge upside down, and dry fluorescent-material coating liquid. For this reason, the thickness of a lock out edge side inside becomes thin, and is a victory. Therefore, the same effectiveness as the case of U typeface fluorescent lamp 1 can be acquired by adopting the approach of drawing 2 and increasing the thickness by the side of a lock out edge, i.e., the free passage section.
[0026]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The front view of U typeface fluorescent lamp in which the 1st example of this invention is shown.
[Drawing 2] The equipment which dries the fluorescent-material coat of this example is shown, the (A) Fig. is a front view and the (B) Fig. is a side elevation.
[Drawing 3] The property Fig. showing the relation between the Ayr rate of flow of an external blow, and the drying time.
[Drawing 4] The property Fig. showing the relation between the Ayr rate of flow of an external blow, and the coating weight of fluorescent material.
[Drawing 5] The property Fig. showing the relation between the Ayr rate of flow of an external blow, and the thickness of fluorescent material.
[Drawing 6] Drawing showing the result of having been transparent and having tested the situation which is in sight.
[Drawing 7] The sectional view of lighting fitting which showed the 2nd example of this invention and built the fluorescent lamp into the reflector.
[Drawing 8] The front view of the zygal fluorescent lamp in which the 2nd example of this invention is shown.
[Description of Notations]
1 -- U typeface fluorescent lamp
10 -- Bulb 11 -- Bay 12 -- Free passage section
14 -- Electrode 15 -- Fluorescent-material coat
20 -- Reflector
30 -- Zygal fluorescent lamp

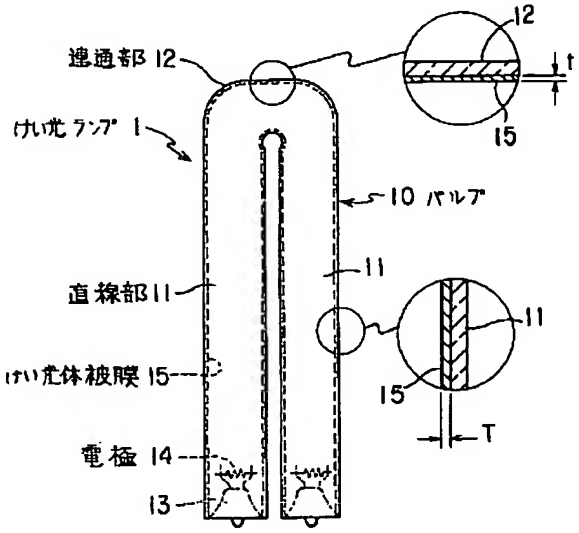
[Translation done.]

* NOTICES *

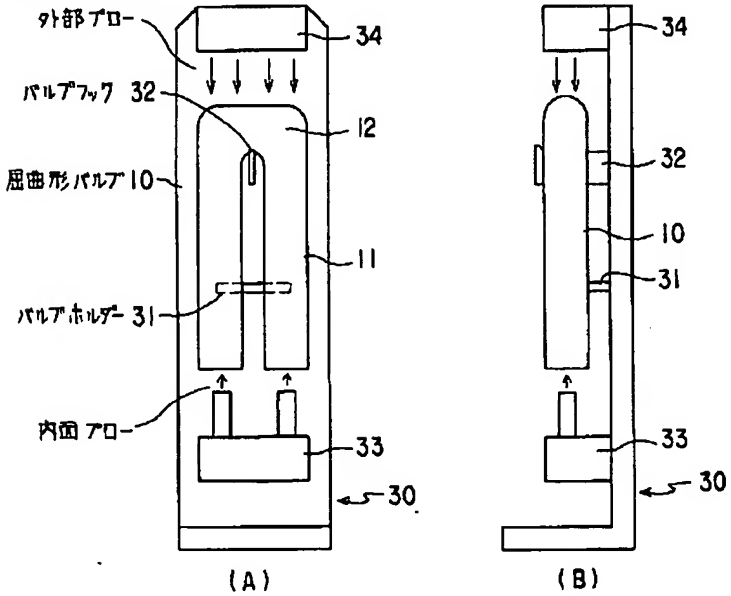
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

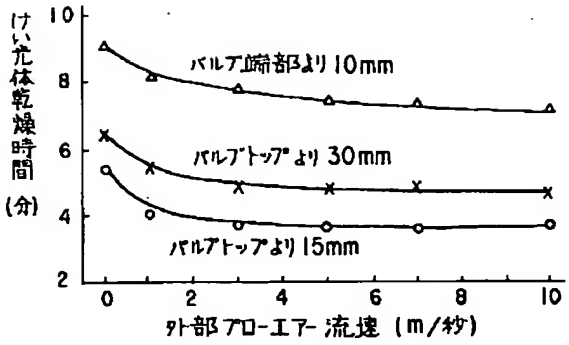
[Drawing 1]



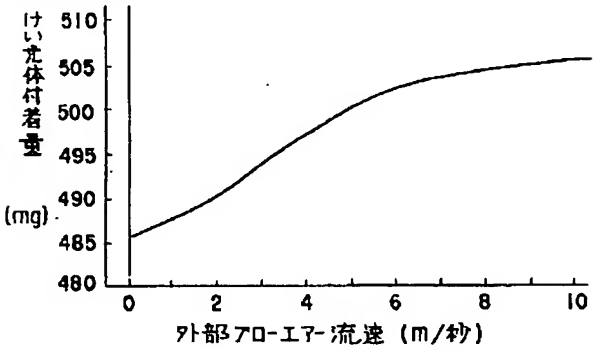
[Drawing 2]



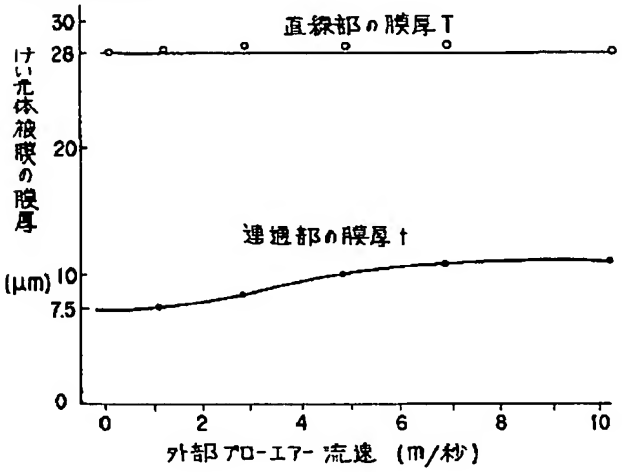
[Drawing 3]



[Drawing 4]



[Drawing 5]

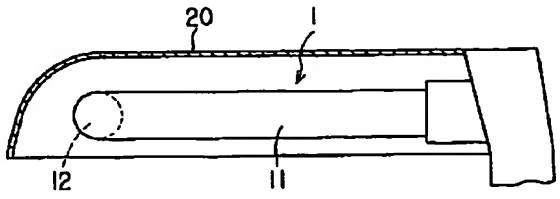


[Drawing 6]

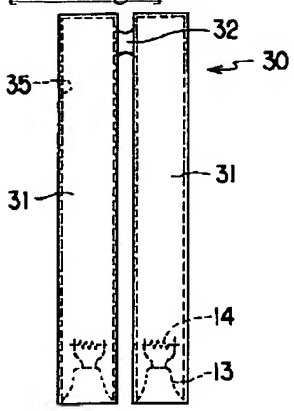
けい光体の膜厚 (μm)	6.25	6.9	7.5	8.0	8.75	9.34
透けて見える状態	x	△	△	○	○	○

x 透けて見える
△ 場合により透けて見え易い
○ 透けて見えない

[Drawing 7]



[Drawing 8]



[Translation done.]

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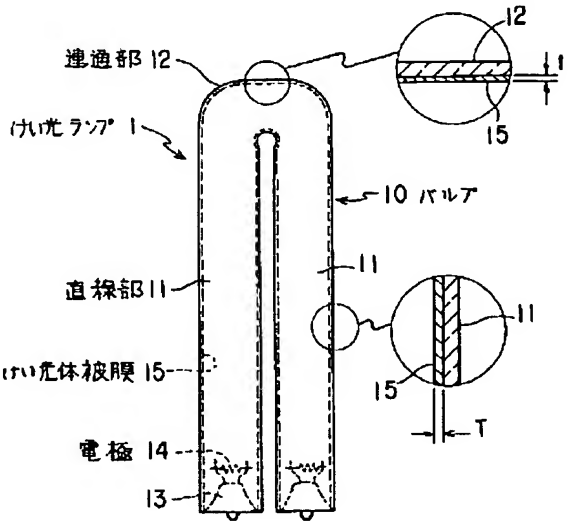
(54)【発明の名称】　屈曲形けい光ランプおよびこれを用いた照明器具

(57)【要約】

【目的】色むらや透けて見えるのを防止し、かつ強度の低下も防止することができる屈曲形けい光ランプおよびこれを用いた照明器具を提供する。

【構成】両端に直線部１１を備えるとともにこれら直線部相互を連通する連通部１２を有するバルブ１０の内面に、けい光体被膜１５を形成した屈曲形けい光ランプ１において、連通部１２におけるけい光体の膜厚ｔを、８．０μｍ以上とし、かつ直線部１１におけるけい光体の膜厚Ｔ以下にしたことを特徴とする。

【作用】連通部のけい光体の膜厚が厚くなり、直線部のけい光体の膜厚との格差が小さくなるので、色むらが解消されるとともに、連通部が透けて見えることがなくなり、かつ膜厚が大きくなるから機械的強度が向上する。



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【特許請求の範囲】

【請求項１】　両端に直線部を備えるとともにこれら直線部相互を連通する連通部を有するバルブの内面に、けい光体被膜を形成した屈曲形けい光ランプにおいて、上記連通部におけるけい光体の膜厚ｔを、８．０μｍ以上とし、かつ直線部におけるけい光体の膜厚Ｔ以下にしたことを特徴とする屈曲形けい光ランプ。

【請求項２】　両端に直線部を備えるとともにこれら直線部相互を連通する連通部を有するバルブの内面に、けい光体被膜を形成した屈曲形けい光ランプにおいて、上記連通部におけるけい光体の膜厚をｔ、直線部におけるけい光体の膜厚をＴとした場合、

０．２８≦ｔ／Ｔ≦１

としたことを特徴とする屈曲形けい光ランプ。

【請求項３】　上記請求項１または請求項２の屈曲形けい光ランプと、このランプの一側方向を覆うとともに他側方向から光を放出する反射体と、を備えたことを特徴とする照明器具。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、Ｕ字形などのような屈曲形状バルブの内面にけい光体被膜を形成した屈曲形けい光ランプおよびこれを用いた照明器具に関する。

【０００２】

【従来の技術】最近、バルブの形状がＵ字形、Ｈ字形またはＷ字形等に屈曲成形されてなるけい光ランプ（コンパクト形と称している）が広く普及しつつある。この種のけい光ランプは、バルブの両端に直線部を有し、これら直線部のそれぞれ一端に電極を封装するとともに他端を屈曲部等のような連通部によって相互に連通した構造をなしており、バルブの内面にはけい光体被膜が形成されている。

【０００３】このような屈曲形けい光ランプにおいて、上記バルブの内面にけい光体被膜を形成する場合は、直線部の開口端を上向きにしてこの開口端からバルブ内にけい光体の塗布液を注入し、このバルブ内に塗布液が充満するとバルブを上下反転して上記開口端から余剰の塗布液を流出させ、これによりバルブの内面を塗布液で濡らしてバルブ内面に塗布するようにしている。そして、開口端を下向きの姿勢に保持したまま、この開口端からバルブの内部に乾燥用のエアーを吹き込み、いわゆるエアーブローすることにより上記塗布液を乾燥させている。

【０００４】塗布液としては有機溶媒にけい光体粉末を溶かした溶液を用いることもあるが、有機溶媒は火災等の事故が心配され、取扱いが面倒であるため、最近は水溶性塗布液を用いる傾向にある。しかし、水溶性のけい光体塗布液は、乾燥が遅いので上記エアーブローにより乾燥を促進させるようにしている。

【０００５】しかし、このようなエアーブローを採用しても、乾燥の過程でバルブ壁面に沿って塗布液が流れ落ち、このため上に位置する連通部はその塗布膜厚が相対的に薄くなり、これに比べて下に位置する直線部は塗布膜厚が厚くなる傾向がある。

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【０００６】

【発明が解決しようとする課題】連通部の膜厚があまりにも薄くなり過ぎると、紫外線を可視光に変換する性能が低下しバルブの位置により色むらを生じるとともに、点灯中に透けて見えることがあり、外観が著しく低下する。特に、反射体によりこの種のランプの一側方向を覆い、他側方向から光を放出する照明器具の場合は、色むらや透けて見えるのが目立つ不具合がある。

【０００７】また、連通部はもともと応力が発生し易い箇所であるのに加えてここのけい光の膜厚が薄いと、機械的強度が低下し、破損し易い不具合もある。本発明はこのような事情にもとづきなされたもので、その目的とするところは、色むらや透けて見えるのを防止し、かつ強度の低下も防止することができる屈曲形けい光ランプおよびこれを用いた照明器具を提供しようとするものである。

【０００８】

【課題を解決するための手段】上記目的を達成するため請求項１に記載の屈曲形けい光ランプは、連通部におけるけい光体の膜厚ｔを、８．０μｍ以上とし、かつ直線部におけるけい光体の膜厚Ｔ以下にしたことを特徴とする。また、請求項２に記載の屈曲形けい光ランプは、連通部におけるけい光体の膜厚をｔ、直線部におけるけい光体の膜厚をＴとした場合、０．２８≦ｔ／Ｔ≦１としたことを特徴とする。請求項３に記載の照明器具は、上記請求項１または請求項２の屈曲形けい光ランプと、このランプの一側方向を覆うとともに他側方向から光を放出する反射体とを備えたことを特徴とする。

【０００９】

【作用】本発明の屈曲形けい光ランプによれば、連通部のけい光体の膜厚が厚くなり、直線部のけい光体の膜厚との格差が小さくなるので、色むらが解消されるとともに、連通部が透けて見えることがなくなり、かつ膜厚が大きくなることから機械的強度が向上する。また、本発明の照明器具によれば、ランプの色むらや透けて見えるのが解消されるから、色や明るさのばらつきがなくなり、配光特性がよくなる。

【００１０】

【実施例】以下本発明について、図１ないし図６に示す第１の実施例にもとづき説明する。図１はＵ字形のけい光ランプ１を示し、図において１０はＵ字形に成形したバルブである。バルブ１０は、両端部に直線部１１、１１を有し、これら直線部１１、１１を屈曲部よりなる連通部１２により相互に連通してある。直線部１１、１１のそれぞれ端部には、ステム１３、１３に支持された電極１４、１４が封装されている。

【００１１】バルブ１０の内面にはけい光体被膜１５が形成されている。けい光体被膜の膜厚はバルブ全面に亘り均等であることが望ましいが、成形時のばらつきのため膜厚差が発生する。しかし、本実施例の場合、連通部１２におけるけい光体の膜厚ｔは９．０μｍ、直線部１１におけるけい光体の膜厚Ｔは平均２８μｍとされており、ｔ／Ｔ＝０．３２となっている。

【００１２】従来の場合、連通部１２におけるけい光体の膜厚ｔは平均でほぼ７．５μｍであり、直線部１１におけるけい光体の膜厚Ｔは平均２８μｍとなっており、ｔ／Ｔ＝０．２６８であった。したがって、本実施例の場合、直線部１１における膜厚は従来と同様であるが、連通部１２における膜厚が従来に比べて大きくなっており、直線部１１と連通部１２との膜厚差は小さくなっている。

【００１３】直線部１１と連通部１２とでけい光体被膜の膜厚差を小さくするには、図２に示す乾燥方法を用いて実現することができる。すなわち、図２における３０はけい光体被膜の乾燥装置であり、内面に水溶性けい光体塗布液を塗った屈曲形バルブ１０を、バルブホルダー３１およびバルブフック３２により、バルブの連通部１２が上を向き、直線部１１が下を向く姿勢で保持する。バルブ１０の下端開口部から内部ブロー装置３３によりバルブ１１の内部に乾燥用のエアーを吹き付ける。このとき、連通部１２の上方から連通部１２の外面に向けて、外部ブロー装置３４により乾燥用のエアーを吹き付ける。

【００１４】内部ブロー装置３３からバルブ１０の内部に吹き付けられるエアーは、温度が室温であり、流速は５．０ｍ／秒程度である。また、外部ブロー装置３４から連通部１２の外面に吹き付けられるエアーは、温度が室温であり、流速は３～７．０ｍ／秒程度である。

【００１５】このように、内部ブローと同時に外部ブローを行うと、連通部１２の温度が外部ブローにより補われるようになる。すなわち、けい光体が乾燥する場合、水分が気化することによりかなりの熱が奪われ、バルブの外表面が水分で曇る程の冷却がなされる。そこで、奪われた熱を補うため、外部からエアーを吹き付けて、このエアーにより熱を供給する。つまり、連通部１２を外部ブローにて部分加熱を行い、この結果連通部１２に塗布したけい光体塗布液の乾燥を促す。

【００１６】但し、この場合、温度の高いエアー（１００～３００℃）を吹き付けると、液だれや膜厚のむらが著しくなり、表面の膜肌が悪化する。これはバルブが急加熱されることから、ベルブの表面に近い塗布液層から乾燥が急速に始まるとともに、塗布液の粘度が急低下するためである。よって、吹き付けるエアーの温度は室温程度が好ましい。

【００１７】図３は、外部ブローのブローエアー流速と、乾燥時間の関係を測定した図である。この特性より、外部ブローの流速が１～３ｍ／秒で乾燥時間が減少する効果が現れる。

【００１８】また、図４は、外部ブローのブローエアー流速と、けい光体の付着量との関係を測定した図である。この図から、外部ブローの流速が７ｍ／秒程度まではけい光体の付着量が上昇する。

【００１９】そして、図５は、外部ブローのブローエアー流速と、けい光体の膜厚との関係を示す。同図から、外部ブローのエアー流速が変わっても直線部１１の膜厚はほとんど変化せず、平均２８μｍ程度である。これに対し、連通部１２の膜厚は、外部ブローのエアー流速が大きくなるにつれて増加しており、流速が７ｍ／秒程度までは膜厚が大きくなる。そして、連通部１２の膜厚は、従来（外部ブローのエアー流速は零）の場合は平均で約７．５μｍであるが、外部ブロー方法を用いると８．０～１２μｍになり、よって連通部１２の膜厚が大きくなる。

【００２０】このようなことから、上記実施例のけい光ランプ１は、連通部１２の膜厚と直線部１１の膜厚の格差が小さくなり、よって紫外線を可視光に変換する機能が差を生じなくなり、連通部１２と直線部１１とで色むらの発生するのが防止される。また、連通部１２は膜厚が大きくなるので、点灯中に透けて見えることがなく、外観も向上する。図６はけい光体の膜厚による外観テストの結果を示すもので、１０人の試験人も目で透けて見えるか否かを判断した表である。この表から、けい光体被膜１５の膜厚が８．０μｍ未満の場合に透けて見える、または透けて見え易いと判断されており、したがって膜厚は８．０μｍ以上がよい。

【００２１】さらに、連通部１２はけい光体を塗布したことにより機械的強度が高くなり、しかもその膜厚が大きい程強度が大きくなる。したがって、応力の集中し勝ちな連通部１２の破損が防止される。なお、けい光体の膜厚があまりに厚くなり過ぎると、けい光体ににより自己吸収のために光量が低下する。このため、直線部１１の膜厚は２８μｍ程度が望ましい。

【００２２】したがって、屈曲形けい光ランプ１は、連通部１２におけるけい光体の膜厚ｔを８．０μｍ以上とし、かつ直線部１１におけるけい光体の膜厚Ｔ以下にすれば、色むらや透けて見えるのが防止され、かつ機械的強度が向上する。これを膜厚比で現すと、連通部におけるけい光体の膜厚をｔ、直線部におけるけい光体の膜厚をＴとした場合、０．２８≦ｔ／Ｔ≦１　にすればよいことになる。

【００２３】上記のようなコンパクト形けい光ランプ１は、図７に示すような反射体２０に組み込まれて、例えばスタンド照明器具として用いられる。反射体２０は下面が開放されたセードをなし、上記けい光ランプ１を水平にして収容し、よってけい光ランプ１は上面側が反射体２０で覆われている。

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【００２４】このような照明器具の場合、ランプ１の直線部１１と連通部１２とで色むらがあると、反射体２０で反射されて下方を照明する光も色むらおよび明るさのむらを生じる。これに対し、前記図１に示すけい光ランプ１を用いた場合、直線部１１と連通部１２とで色むらが解消されるから、下方を照射する光に色むらおよび明るさのむらがなくなり、配光特性がよくなる。

【００２５】なお、上記実施例の場合、U字形のけい光ランプについて説明したが、本発明はW字形のけい光ランプであってもよい。また、本発明は、図８に示すH字形のけい光ランプであってもよい。H字形のけい光ランプ３０は、２本の直管形ガラスチューブ３１、３１をその閉塞端部の近傍で、溶融接合部３２により接合したものであり、放電路が実質的に屈曲形状となるから本発明の屈曲形けい光ランプの１種として考えて差支えない。この場合、けい光体被膜３５は、予め溶融接合部３２により接合する前に、それぞれの直管形ガラスチューブ３１、３１の内面に形成しておき、その後でガラス壁を加熱溶融して吹き破り、この吹き破り箇所で接合するようになっている。しかしながら、それぞれの直管形ガラスチューブ３１、３１の内面にけい光体被膜を形成する時、各チューブ３１、３１は一端が閉塞されているので、図２に示す場合と同様に、開口端を下向きにしてけい光体塗布液の乾燥を行う。このため、閉塞端部側内面の膜厚が薄くなり勝ちである。よって、図２の方法を採用して、閉塞端部側、すなわち連通部側の膜厚を増加することにより、U字形けい光ランプ１の場合と同様の効果を得ることができる。

【００２６】

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【発明の効果】以上説明したように本発明によれば、連通部のけい光体の膜厚が厚くなり、直線部のけい光体の膜厚との格差が小さくなるので、色むらが解消されるとともに、連通部が透けて見えることもなくなり、かつ膜厚が大きくなることから機械的強度が向上する。

【図面の簡単な説明】

【図１】本発明の第１の実施例を示すU字形けい光ランプの正面図。

【図２】同実施例のけい光体被膜を乾燥する装置を示し、（Ａ）図は正面図、（Ｂ）図は側面図。

【図３】外部ブローのエアー流速と乾燥時間との関係を示す特性図。

【図４】外部ブローのエアー流速とけい光体の付着量との関係を示す特性図。

【図５】外部ブローのエアー流速とけい光体の膜厚との関係を示す特性図。

【図６】透けて見える状況をテストした結果を示す図。

【図７】本発明の第２の実施例を示し、けい光ランプを反射体に組み込んだ照明器具の断面図。

【図８】本発明の第２の実施例を示すH字形けい光ランプの正面視図。

【符号の説明】

１…U字形けい光ランプ

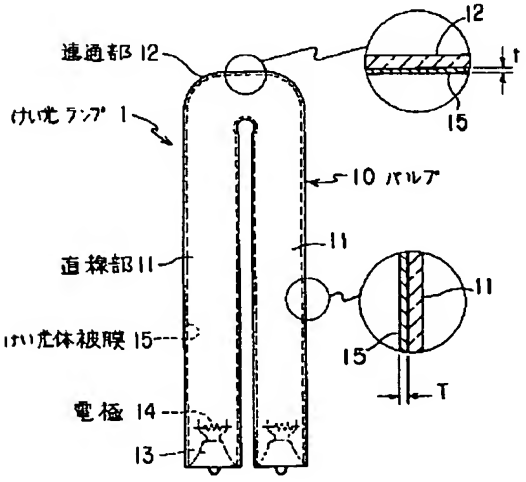
１０…バルブ　　１１…直線部　　１２…連通部

１４…電極　　１５…けい光体被膜

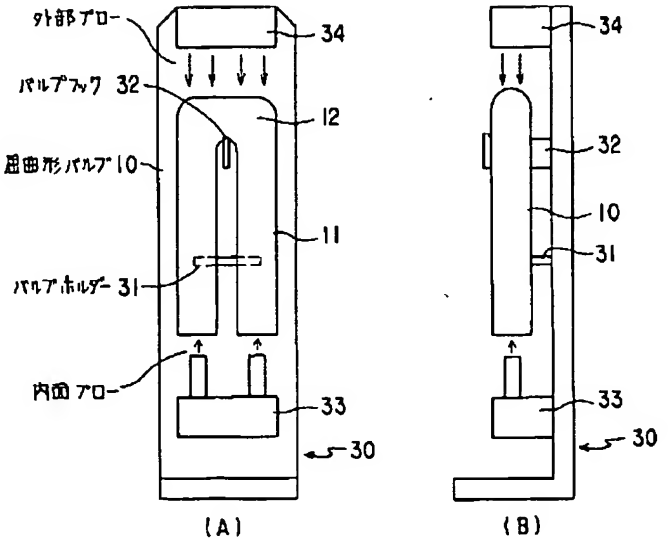
２０…反射体

３０…H字形けい光ランプ

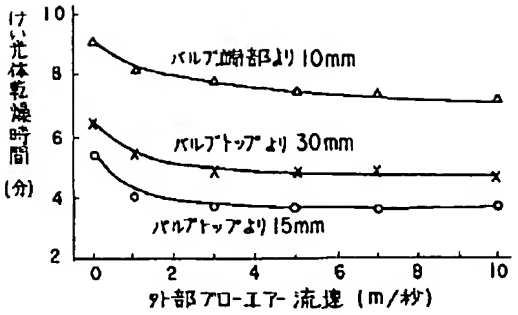
【図１】



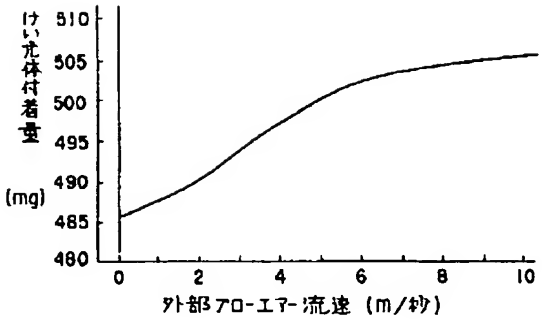
【図２】



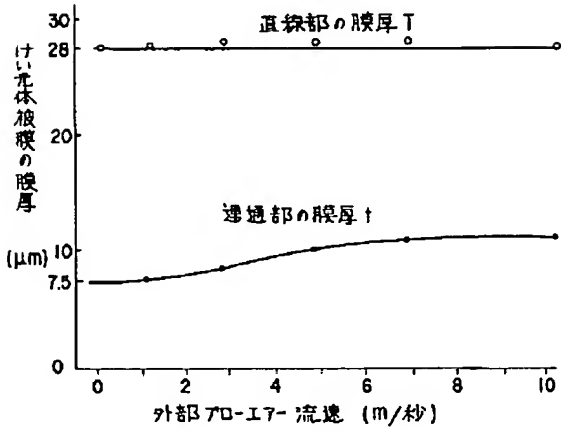
【図3】



【図4】



【図5】

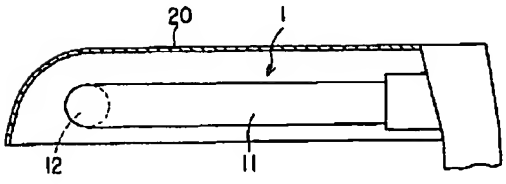


【図6】

けい光体の膜厚 (μm)	6.25	6.9	7.5	8.0	8.75	9.34
透けて見える状態	×	△	△	○	○	○

× 透けて見える
△ 場合により透けて見え易い
○ 透けて見えない

【図7】



【図8】